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Traditional and alternative natural therapeutic products used in the treatment of respiratory tract infectious diseases in the eastern Catalan Pyrenees (Iberian Peninsula)

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ABSTRACT

Ethnopharmacological relevance: Respiratory tract diseases, including mild troubles, such as the common cold, and also life-threatening ones such as bacterial pneumonia and lung cancer, are very important in terms of mortality, incidence, prevalence and costs. Classical medicine has undoubtedly addressed these illnesses, but the body of

knowledge generated by alternative approaches, among which folk medicine plays an important role, is not at all negligible.

Aims of the study: In this context, we performed an ethnobotanical study in a Catalan region of the eastern Pyrenees, northeast Iberian Peninsula, in order to assess the popular knowledge on useful plants. We present here the data concerning pharmaceutical uses of plants devoted to respiratory illnesses.

Methodology: A total of 160 informants (94 women and 66 men, born between 1915 and 1988) were interviewed during 102 semi-structured interviews. Voucher specimens were collected, and then processed and deposited in the herbarium BCN.

Results: We collected information about 99 plant taxa (94 species -some of them with subspecies- of 85 genera belonging to 50 families) popularly employed to prevent or treat respiratory troubles. The degree of reliability of uses is high, as indicated for instance by an informant consensus factor of 0.83 and by high medicinal importance indexes for many taxa. In addition, we have recorded information on 14 animal and four mineral products also used against respiratory ailments, this constituting the first ethnopharmacological work in the Catalan linguistic area to report plant, animal and mineral remedies, and one of the very few in the Iberian Peninsula involving the study of ethnozoological medicines.

Conclusions: The data collected show a high degree of consistency and indicate a remarkable persistence of folk knowledge on plant uses. The anticatarrhal, antitussive and for sore throat are the most valuable uses. This research could be the starting point for further research aiming to obtain products that may generalise the alternative medical uses here raised at a local level. Phytochemical and pharmacological studies on some of the plants quoted here -of which we could provide material to potentially interested researchers- would be useful first steps in this process.

1. Introduction

"Respiratory tract diseases" is a medical term that encompasses pathological conditions affecting the air passages, including the nasal passages, the bronchi and the lungs. These health troubles range from acute infections, such as pneumonia and bronchitis, to chronic conditions such as asthma and chronic obstructive pulmonary disease (COPD) and include unspecific symptoms such as dyspnea. The most common respiratory diseases are mild and self-limiting, such as the common cold, but some are life-threatening, like bacterial pneumonia, pulmonary embolism, and lung cancer. Respiratory diseases are second to cardiovascular conditions in terms of mortality, incidence, prevalence and costs. The biggest contributors to respiratory death in Europe are lung cancer, pneumonia and chronic obstructive pulmonary disease. Worldwide, hundreds of millions of people suffer every day from chronic respiratory ill-health. According to WHO global estimates, 300 million people suffer asthma, 210 million people have COPD, while millions more show allergic rhinitis and other, often under-diagnosed, chronic respiratory conditions (European Respiratory Society, 2010).

In this study, we focused on the infectious diseases, but have also collected data for all the respiratory illnesses. Pneumonia is an inflammation of the lungs caused by an infection by bacteria, viruses or fungi, and producing fever, cough and breathing difficulties (Casassas, 1990). Usually, a physical examination can determine if a patient has pneumonia, which is relatively frequent. The annual incidence rate is 6/1000 in the 18-39 age group and this rises to 34/1000 in people aged 75 years and over (Hoare and

Lim, 2006). Nowadays, antibiotic agents constitute the common treatment for bacterial pneumonia, but in the last two centuries, especially before the use of antibiotics, several remedies were used to treat pneumonias and related disorders. Other diseases commonly treated with traditional remedies are asthma, bronchitis and unspecific symptoms such as breathlessness (dyspnea). In the recent past, the non-serious respiratory troubles such as common colds, influenza or sore throat, among others, were usually treated with remedies mostly based on plants while, when the pneumonia or pleuritis symptoms were recognised, a specialist was needed and more complicated and strange therapies were used in our geographical area. Nowadays, alternative medicine is only used in common respiratory infectious diseases, and the more severe ailments are treated in hospital.

Phytotherapy has always provided efficient remedies for chronic and moderate health troubles and sometimes for acute and severe disorders (see, among others, Shoskes, 2002; Santos-Neto et al., 2006; Sureshkumar, 2012). Ethnobotany and ethnopharmacology have proved themselves as relevant approaches to establish folk medicinal knowledge in the different territories or ethnic groups, this being useful in drug design and discovery (Heinrich and Gibbons, 2001; Lewis, 2003). The above-mentioned ethnopharmacological work deals with a high number of popularly-employed medicinal plants, and highlights uses that can constitute good complements to conventional or allopathic medicine and their palliative properties.

Respiratory disorders constitute the second group in order of importance mentioned by the informants in previous studies carried out in the Iberian peninsula and other Mediterranean regions (Rigat et al., 2006, 2007; Parada et al., 2009, and references therein). The most common remedies include plants with several administration forms (aerosols, cigarettes, poultices, smokes, tisanes, etc.) but other

recipes involve animal and mineral products as well (Bonet and Vallès, 2006; Rigat et al., 2006; Parada, 2007; Agelet, 2008; Vallès, 2007). In addition, some of these recipes involve oils and ointments, which were elaborated and sold elsewhere in the Pyrenees by the women called "trementinaires", a Catalan name coming from "trementina", turpentine (Frigolé, 2007). Some of these remedies, oddly enough, have been used for years and should have some scientific basis worth investigating, while others could be included within the category of ritual.

Taking into account the incidence of respiratory ailments and the vigour of folk knowledge on plant uses in the Catalan Pyrenees, the objective of this work is to know and understand the plants and other remedies used in the treatment of such diseases by people inhabiting the eastern part of the mentioned area, complemented with data contained in some available historical documents from the same territory (provided by an informant) and to contribute towards possible new drugs and preparations from natural sources.

2. Material and methods

2.1. Studied area

The studied area is the district ("comarca" in Catalan, the informants' language) of Ripollès, situated in the eastern Pyrenees (Catalonia, Iberian Peninsula), and comprises three valleys: the river Ter valley, the river Freser valley and the Baix Ripollès (Fig. 1). The Northern part belonging to the axial Pyrenees has several peaks of almost 3000 m. Concordantly with this, the weather is typical of high mountain areas, with cold winters (mean temperature around 10.6 ºC) and a mean annual precipitation of 1487.2 mm (data corresponding to 2011, www.idescat.cat), although softened by the proximity of the Mediterranean Sea. Landscape is basically alpine and subalpine (Vigo,

2010). Ripollès district comprises 956.24 km^2 and 26821 inhabitants distributed in 19 municipalities, some of which have suffered an important population decrease, though partly compensated in recent years by tourism and second residences. A high percentage of the population inhabits small villages and isolated houses. Agriculture is not a relevant economical issue, given its climatic conditions and uneven territory, but many farms and houses within the villages have their own homegardens for private consumption. In the past, conventional medicine was not easily accessible for these people, and the use of plants or other natural resources was necessary in order to survive in the extreme conditions. Nowadays, official health care service reaches everybody in the region, but traditional practices seem to remain active to some extent.

Respiratory ailments used to have a high incidence in the studied area. In one of its three valleys (high river Ter valley), data from the period 1900-1924 (Sau, 1928) show 895 cases of death due to these ailments (influenza 48, diphtheria and croup 79, pulmonary tuberculosis 129, acute and chronic bronchitis 167, pneumonia 472) in a population of 5786, this being, together with heart diseases, the main cause of mortality. This high incidence leads us to suppose a considerable body of acquired knowledge among these people in order to combat such illnesses.

2.2. Interviews

We used semi-structured interviews (Pujadas et al., 2004) as a tool for obtaining information from our participants, avoiding too-direct questions in order not to influence people's answers. The interviews, which were practised and recorded after informing the informants on their purposes and receiving their consent, were performed from August 2004 to October 2012. Native people, mostly the elderly, who were selected on a snowball basis (Goodman, 1961), were interviewed in the Catalan

language, common to interviewers and interviewees, the interviews being transcribed and the data compiled in the online database of our research group. The cited plants were identified using Bolòs et al. (2005) and the herbarium vouchers have been deposited in the herbarium BCN (Centre de Documentació de Biodiversitat Vegetal, Universitat de Barcelona). A total of 160 informants (94 women and 66 men, born between 1915 and 1988) were interviewed during 102 interviews (59 individual and 43 collective). Sometimes, additional interviews were carried out in order to confirm the preliminary results, and information from historical works and an old manuscript was also collected as a complement.

2.3. Quantitative ethnobotany and statistical analyses

Some ethnobotanical quantitative indexes have been calculated from the obtained dataset. The informant consensus factor (F_{IC}; Trotter and Logan, 1986) was calculated as the quotient between the number of respiratory use reports (UR) minus the number of used taxa and the number of respiratory use reports minus one. This index is more reliable when closer to 1. The index of medicinal importance (MI), recently proposed by Carrió and Vallès (2012), was also calculated, dividing the total use reports for a specific use-category by the number of taxa possessing this use. Statistical analyses and graphics were carried out with Excel (Microsoft office 2003).

3. Results and discussion

The results obtained are summarized in Tables 1 and 2. Table 1 presents the information regarding plants and plant products, which are, by far, the majority. Table 2 includes a much lower, though equally relevant, data set on animals and their products

as well as on mineral remedies.

3.1. Plant taxa and reported uses

Ninety nine plant taxa corresponding to 94 species, 85 genera and 50 families have been used in the traditional medicine against respiratory disorders in the studied area (Table 1). A total of 567 use reports (UR) have been collected for 96 taxa (three of them have been discarded because of their uses as excipients or similar). Although the average is 5.85 ± 9.87 use reports per taxon, some of them have been reported by only one informant, probably suggesting an erosion of this knowledge, which is a common feature to many industrialised areas and even present in non-industrialised territories (Payyappallimana, 2010, and references therein). In addition, the informants have frequently forgotten the plants used against these diseases. This could mean that their use was quite restricted. Several plants are used in a mix, thus potentiating the effects due to the synergy among them.

The most cited families are Lamiaceae (85 UR, 14.99%), Pinaceae (64 UR, 11.29%), Caprifoliaceae (59 UR, 10.41%), Asteraceae (51 UR, 8.99%) and Tiliaceae (48 UR, 8.47%). These data suggest that, apart from good experience of the informants with the use of each plant they finally select, ease of collection may also add a certain weight in explaining what plants are used by local people in the studied area. Species belonging to the Lamiaceae and Asteraceae families are particularly abundant in the Mediterranean flora (Bolòs et al., 2005). The Pinaceae are not so relevant in terms of number of taxa, but have some landscape-dominant species in the studied area. Finally, the two remaining families comprise some taxa present in abundance in the local flora. Several authors have cited an observed correlation between plant uses and availability or proximity (Bonet and Vallès, 2003; Parada et al., 2009; Carrió and Vallès, 2012, and

references therein).

3.2. Respiratory disorders treated

The present results could be somehow biased if we strictly focus on pneumonia, because of the difficulties in distinguishing this illness from some related respiratory diseases, and also due to the descriptions provided by the informants, usually referring to some not clearly identified lung troubles. This is why we have addressed in this paper all treatments related to the respiratory system. These uses are relevant in folk medicine, accumulating a high percentage of citation in several studies in very different parts of the World (Disengomoka and Delaveau, 1983; Said et al., 2002; Pieroni and Quave, 2005; Parada, 2007; González et al., 2010; Cakilcioglu et al., 2011). In the present study, the obtained results for the respiratory tract diseases treated with plants have also been numerous (Table 1 and Fig. 2). Anticatarrhal (58%) is the most cited use followed by the uses for sore throat (11%) and antitussive (10%). These kinds of troubles are quite common in the studied area due to its cold climate, but they do not constitute very serious disorders. Both features (the prevalence and the mildness of these illnesses) make it easy to treat these troubles or symptoms with plant remedies, and several plants (see Table 1) are used as coadjuvants in the treatment of these diseases. Plant uses for the more serious illnesses, such as tuberculosis, pneumonia, asthma or pleuritis, are scarcely cited, and the remedies are usually more sophisticated, sometimes even bearing a magical component (Table 1).

In addition to the above-commented plant availability, a frequent mechanism to select the plants that are to be tested for use in folk medicine is the so-called doctrine or theory of signatures, according to which morphological characteristics of plants would indicate their therapeutic properties (Bennett, 2007). We found in the present

prospection an evidence of its productivity in the citation of *Pulmonaria longifolia*, used for lung spots. This claimed property to improve pulmonary conditions, which is expressed that way by the informants, could be interpreted based on this theory due to the association of the spots in the lung with the leaves' spots, which are evident in the plant. This is not just the case of a belief or a magical use. In fact, it implies choosing a remedy to be tested (and most probably rejected if its efficacy is not confirmed) based on this morphological association.

3.3. Plant parts used, their preparation and administration

The most used parts of plants are flowers and inflorescences (26.63% of UR), followed by flowered aerial parts (17.81%), fruits (including parts of fruit and fruit juice, 12.87%), leaves (11.29%), roots (9.70%), cones (6.35%) and buds (5.82%). The whole plants or the remaining parts of a plant such as bulbs, tubers or seeds among others, represent percentages below 5% of use reports. This agrees with the results in a neighbouring Catalan region (Parada et al., 2009), but somehow contrasts with other works, in which, frequently, the parts of plant most used are leaves (Carrió and Vallès, 2012; Sharma et al., 2012; Tag et al., 2012).

Several methods of preparation have been found in our study (Fig. 3), among which tisane is largely the most used (63% of UR), followed by syrup (13%), poultice (6%), tincture (5%) and aerosol (called "bafs" in Catalan; 4%). Regarding the means of administration, internal use (87% of UR) is much more common than external (13%). The tisane is obtained by a decoction (boiling in water) of different parts of the plant, and usually its administration way is internal. Contrary, the poultice is generally for external use. People believe that it is necessary "to pull the pain out" with a remedy that is able to extract the blood or the liquid from the lung. Sometimes they explain that the

poultice was stained with blood after its application. One of the authors (JI), who is a medical doctor, saw many years ago a bloodied poultice after this treatment. We have two possible explanations for this fact. The first one is that the blood comes from an exudate caused in the lung by the toxicity of the microbial agents. The selective permeability of the endotelial wall increases when an inflammatory process occurs, producing an exudate containing a large number of erythrocytes at the same time that a thrombocytopenia takes place. This is difficult to understand, because the blood from the lung would be retained in the pleural space. The second and more plausible explanation is that the blood is produced by an irritation of the surface of the treated area by the ingredients used in the poultice. Flax meal may cause skin irritations, especially if it is not recent (Font, 1961).

For most methods, plants are the most commonly used agents, but for the poultices, both plants and several remedies of other origins have been collected (see Table 2 and later in the text the subheading on other remedies). The poultices or, simply, rubs have been made with oil in which animal droppings, animal parts or the whole animal were macerated. The wire cloth folded seven or nine times was the traditional method of making a poultice, but other alternatives are also collected for pneumonia treatment such as a hot shoe sole impregnated with oil or clay. One aspect of this use pattern indicates another common trait in ethnobotany, almost as quoted in medical anthropology as the theory of signatures: the dominance of odd numbers (mostly 7 and 9) in folk phytotherapy, here exemplified with nine folds, but often also expressed in terms of number of days of a treatment or number of plant parts -flowers, leaves or others- used to prepare a remedy (Gavilanes, 1995). Alcohol, oil, vinegar, wine, and other products such as turpentine have been used as excipients.

3.4. Quantitative ethnobotany

The species cited with highest number of UR are *Sambucus nigra* (59), *Tilia platyphyllos* (48), *Althaea officinalis* (34), *Arnica montana* subsp. *montana* (29), *Pinus mugo* susbp. *uncinata* (26), *Hyssopus officinalis* (26) and *Ramonda myconi* (24). These plants are quite different from those most cited in other Catalan territories (where all the medicinal uses were studied), excepting *Sambucus nigra* (Parada et al., 2009), this highlighting the important role played by local flora in the plants used for healing.

The number of plants with a respiratory use per informant is 0.59 if only the species are considered and 0.60 when the infraspecific taxa are also included. The data collected show a high consistency. On the one hand, 39 uses have been quoted by three or more informants, representing 15.2% of all reported uses. This means that a non-negligible part of folk plant remedies in the studied area meets the reliability criterion of Le Grand and Wondergem (1987) and Johns et al. (1990). This may seem a rather poor percentage, but it is comparable to that found in other territories (Parada et al., 2009, and references therein); in addition, uses quoted by two or only one informant may be the remnants of a formerly more expanded knowledge, now rather precarious due to the acculturation suffered in all industrial societies, among which the considered one. On the other hand, the informant consensus factor (F_{IC}) is high (0.83 of a maximum of 1, as defined by Trotter and Logan, 1986), indicating a high degree of agreement in the treatment of respiratory diseases in the area studied. This value is similar to the previous ones obtained in the high river Ter valley for total medicinal uses (0.87; Rigat et al., 2007) and higher than the values for this factor found in Mallorca (0.71; Carrió and Vallès, 2012) and those reported from Mexican areas (0.75 and 0.79; Heinrich et al., 1998; Leonti et al., 2001). In a neighbouring territory, Alt Empordà, the general consensus factor is higher (0.91), but that concerning respiratory ailments is

considerably lower (0.62) than in the present work (Parada et al., 2009). These high consensus results encourage deeper pharmacological studies on this subject in the sampled area.

The medicinal importance indexes (MI) for all the respiratory troubles are summarized in Fig. 2. According to this index, the anticatarrhal (5.27), antitussive (2.80) and for sore throat (2.48) are the most valuable uses. No data are available to make comparisons for each disease. All these data together clearly account for a high reliability of the data recorded.

3.5. Other remedies

During our ethnobotanical prospection, the informants often referred to non-plant organisms or products (Table 2); this was not at all as frequent as were the quotations on plants and their derivatives, but informative enough to be reported here. That way, this is the first scientific paper on folk medicine in the Catalan linguistic area contributing ethnobotanical, ethnozoological and ethnomineralogical data. Only a very few works on Iberian ethnobiology have reported to date zoological information (Benítez, 2011, and references therein).

Concerning animals, only two out of the 14 taxa claimed to be useful for respiratory diseases by our informants were quoted with similar purposes (for colds) by Benítez (2011): *Apis mellifera* and *Rhinechis scalaris* (*Elaphe scalaris*), the second one named as *Elaphe* and not determined at specific level in the work quoted. Three more taxa are coincidental with the mentioned paper, but not with uses related to respiratory troubles, and the remaining eight taxa are not present in Benítez (2011). Taking into account that this paper covers all areas of animal uses, this comparison indicates that our information on this field is important.

As for mineral products, the report by two informants of an antipneumonic poultice based on clay is particularly remarkable. At present, mineral products are very scarcely cited in ethnopharmacological works and, in addition, this is not the more widely known medicinal property of clay. Clay use for pharmaceutical purposes has a very long tradition, extending at least from Roman times, where the so-called Armenian ball -a remedy that has reached our days- was basically employed as an astringent, but had also been claimed as “good for the humours distilled by lungs” (Bech, 1987, and references therein; Casassas et al., 1990).

4. Concluding remarks

The present study is the first one in the Catalan territories to focus on respiratory tract diseases. Semi-structured interviews were conducted and obtained results were supplemented with information from old and unpublished documents (belonging to one informant) in order to preserve the folk knowledge on folk medicine, focused on respiratory ailments. . The data collected show a high degree of consistency and indicate a remarkable persistence of folk knowledge on plant uses. This is the first step in pharmaceutical bioprospection, which has contributed sufficient data of a reliable nature. These data may be the starting point for further research aimed at obtaining products that may generalise the alternative medical uses here considered at a local level. Phytochemical and pharmacological studies on some of the plants quoted here -of which we could provide material to potentially interested researchers- would be useful first steps in this process.

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Fig. 1. The territory studied, showing its municipalities, in the context of the Iberian Peninsula and the territories where the Catalan language is spoken.

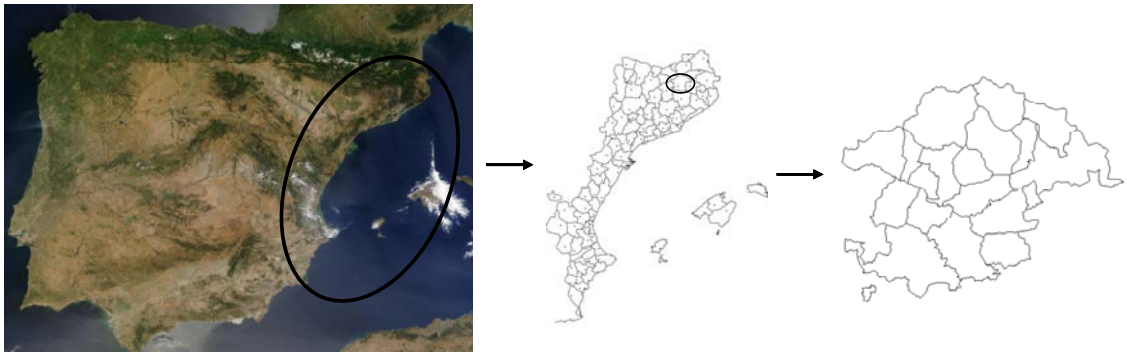

Fig. 2. Percentage of use reports for respiratory disorders. Percentages below 2% are not given a number. The indexes of medicinal importance (MI; Carrió and Vallès, 2012: total use reports for a specific use-category divided by the number of taxa possessing this use) for the different activities are indicated within parentheses.

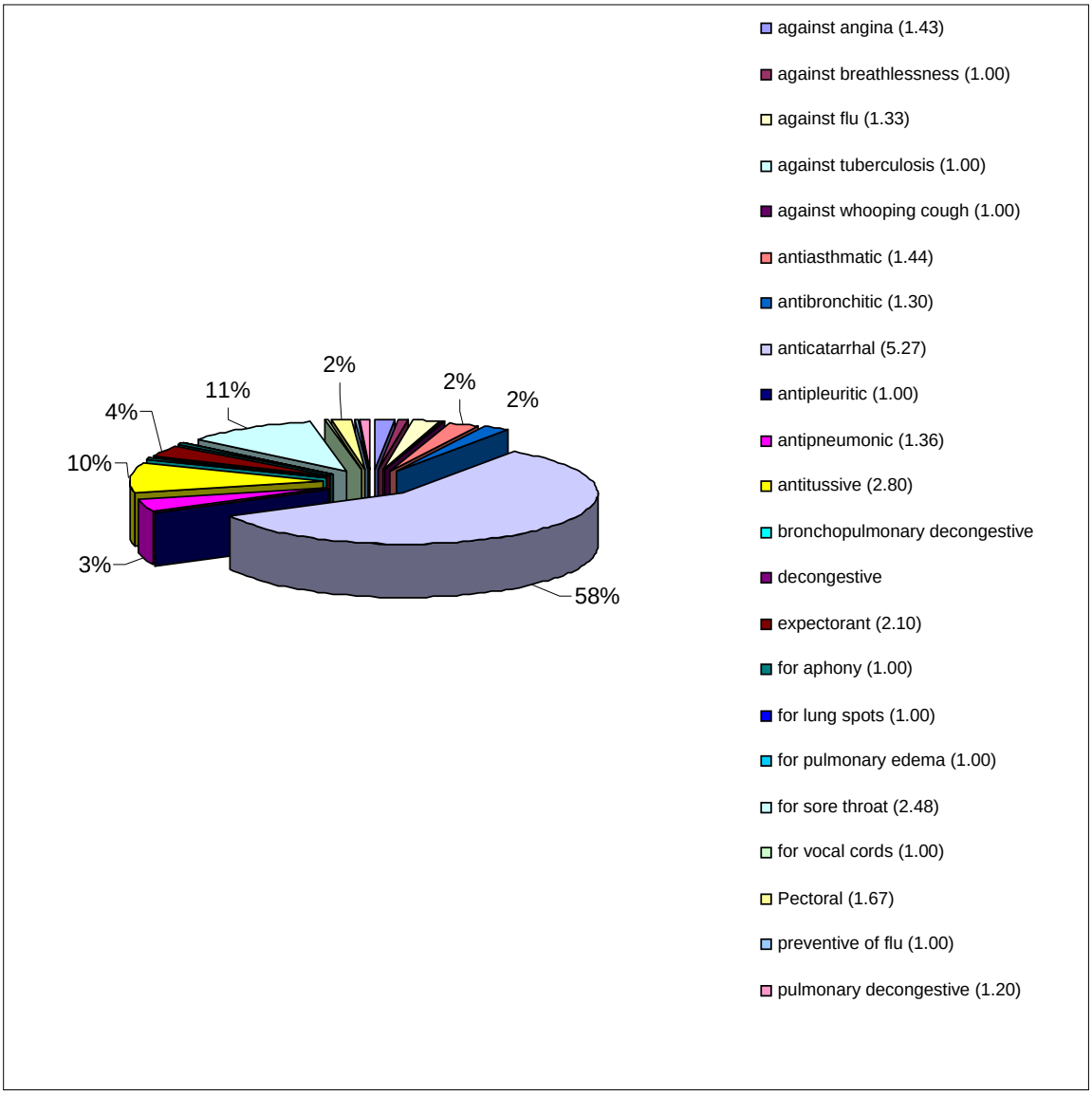

Fig. 3. Pie chart representing the percentage of use reports for each preparation form.

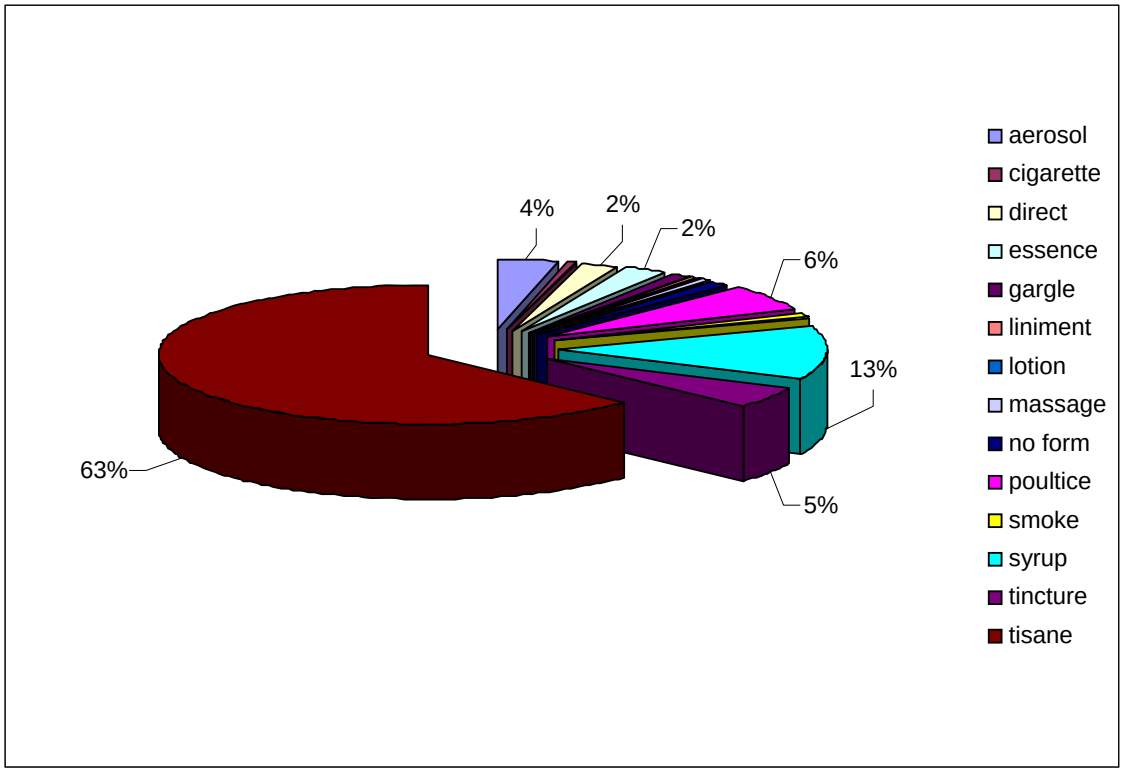

Table 1
Plants used for medicinal purposes for respiratory diseases in the studied area.

Scientific name (family)	Local Catalan name	Part of plant used	Medicinal use	Administration form	Administration way	Reports
Abies alba Mill. (Pinaceae) (BCN 24699)	Avet, avet de Setcases, oli d'avet (product)	Cone	Antiasthmatic Pectoral Antiasthmatic Pectoral Anticatarrhal Antitussive Pectoral Against flu	Without pharmaceutical form Tisane Syrup	External Internal	1 1 1 1 6 2 2 1
Achillea ptarmica L. subsp. *pyrenaica* (Sibth. ex Godr. in Gren. et Godr.) Rouy (Asteraceae) (BCN 24701)	Camamilla, camamilla de muntanya, camamilla de Núria, camamilla de Rojà	Inflorescence	Anticatarrhal	Tisane	Internal	5
Adiantum capillus-veneris L. (Polypodiaceae) (BCN 67717)	Falguerola	Aerial part	Anticatarrhal	Tisane	Internal	1
Allium cepa L. (Amaryllidaceae) (BCN 27279)	Ceba	Bulb	Anticatarrhal Antitussive Preventive of flu	Tisane	Internal Internal	2 2 1
Allium sativum L. (Amaryllidaceae) (BCN 24708)	All	Bulb	Antibronchitic	Tincture	Internal	1

Althaea officinalis L. (Malvaceae) (BCN 24709)	Arrel de malví, malvasí, malví	Root	Antibronchitic Anticatarrhal Expectorant Antitussive Antitussive Anticatarrhal Antipneumonic Against whooping cough Against angina For sore throat	Tisane Syrup Tisane 	Internal	1 8 8 1 8 1 1 1 1 4
Amelanchier ovalis Medic. (Rosaceae) (BCN 16410)	Cornier	Aerial part	Anticatarrhal	Tisane	Internal	1
Anthemis arvensis L. (Asteraceae) (BCN 31624)	Bòligs, sistorna	Inflorescence	Anticatarrhal	Tincture	External	1
Antennaria dioica L. (Asteraceae) (BCN 34297)	Pota de gat	Flowered aerial part	Anticatarrhal	Tisane	Internal	1
Arnica montana L. subsp. *montana* (Asteraceae) (BCN 24716)	Àrnica, flor de tabac	Inflorescence	Anticatarrhal Antitussive Anticatarrhal Pulmonary decongestive Against breathlessness	Tincture Tisane Tincture Essence	External Internal	3 1 23 1 1
Artemisia absinthium L. (Asteraceae) (BCN	Donzell	Aerial part	Pulmonary decongestive	Tincture	External	2

24717)						
Asperula cynanchica L. (Rubiaceae) (BCN 24722)	Herba prima	Flowered aerial part	Anticatarrhal	Tisane	Internal	1
Asplenium trichomanes L. (Polypodiaceae) (BCN 24723)	Auradelleta, costelles de paret	Aerial part	Antitussive	Tisane	Internal	1
Beta vulgaris subsp. *vulgaris* var. *crassa* (Alef.) Helm (Chenopodiaceae) (BCN 50761)	Sucre, sucre candi, sucre roig (product)	Root	Excipient			
Betula pendula Roth. (Betulaceae) (BCN 27263)	Beç	Leaf	For pulmonary edema (diuretic)	Tisane	Internal	1
Bryonia cretica L. (Cucurbitaceae) (BCN 24730)	Carbassina	Root	Against pleuritis Anticatarrhal	Poultice	External	1 1
Calendula officinalis L. (Asteraceae) (BCN 24732)	Boixac	Inflorescence	For sore throat	Gargle	External	1
Ceterach officinarum DC. in Lam. et DC. (Polypodiaceae) (BCN 24747)	Dauradella	Aerial part	Anticatarrhal	Tisane	Internal	1
Cinnamomum camphora (L.) Sieb. (Lauraceae) (BCN 50766)	Càmfora (product)	Excipient	Anticatarrhal	Tincture	External	1
Citrus limon (L.) Burm. (Rutaceae) (BCN 27241)	Llimona, llimoner	Epicarp Fruit juice	Anticatarrhal Anticatarrhal Antitussive	Syrup Tisane Direct	Internal	2 1 1

		Fruit	For sore throat Antitussive Anticatarrhal Against flu	Gargle Direct Without pharmaceutical form Syrup	External Internal Internal	1 3 1 2 1
Citrus sinensis (L.) Osbeck (Rutaceae) (BCN 24752)	Taronger, taronja	Epicarp Fruit juice	Anticatarrhal Anticatarrhal (preventive)	Syrup Direct	Internal	1 1
Datura stramonium L. (Solanaceae) (BCN 29688)	Castanyer bord	Leaf	Antiasthmatic	Cigarette	Internal	1
Echium vulgare L. (Boraginaceae) (BCN 24766)	Burranga	Aerial part	Anticatarrhal	Tisane	Internal	1
Eucalyptus globulus Labill. (Myrtaceae) (BCN 24883)	Eucaliptus	Leaf	Anticatarrhal Expectorant Antipneumonic Expectorant Pectoral	Aerosol Tisane	Internal	10 1 1 1 1
Ficus carica L. (Moraceae) (BCN 24887)	Figa, figa seca, figuera	Dried fruit	Anticatarrhal	Syrup Tisane	Internal	1 1
Foeniculum vulgare Mill. (Apiaceae) (BCN 24888)	Fonoi	Aerial part	Against breathlessness	Tisane	Internal	1
Geranium robertianum L. (Geraniaceae) (BCN 24894)	Cicuta (often pronouced ‘secuta’), herba de Sant Robert	Aerial part	Antipneumonic For sore throat	Poultice Gargle	External	1 1
Hedera helix L. (Araliaceae) (BCN 27262)	Heura	Fruit	Antiasthmatic Antipneumonic	Tisane	Internal	1 1
Helianthemum	Herba del mal de	Aerial part	For sore throat	Tisane	Internal	1

oelandicum Mill. (Cistaceae) (BCN 24897)	coll					
Herniaria glabra L. (Caryophyllaceae) (BCN 24901)	Herba de milgrà, Noè	Aerial part	Anticatarrhal	Tisane	Internal	1
Hypericum perforatum L. (Hypericaceae) (BCN 24905)	Cop, flor de cop, flor de Sant Joan, herba de cop, herba de Sant Joan, trescamp	Flowered aerial part	Anticatarrhal Antipneumonic	Tincture Liniment	External	1 1
Hyssopus officinalis L. (Lamiaceae) (BCN 24906)	Hisop	Flowered aerial part	Anticatarrhal Antitussive Against flu Antibronchitic Pectoral	Tisane Tincture Syrup Tisane Tisane Tincture Syrup Tisane	Internal	18 1 1 1 1 1 1 2
Jasonia saxatilis (Lam.) Guss. (Asteraceae) (BCN 24496)	Te de roca	Flowered aerial part	Anticatarrhal	Tisane	Internal	1
Juniperus communis L. (Cupressaceae) (BCN 24910)	Ginebre, ginebró, oli de ginebre (product)	Seed	Antipneumonic	Poultice	External	4
Lavandula angustifolia Mill. subsp. *angustifolia* (Lamiaceae) (BCN 24913)	Barballó, bermelló (often pronounced 'bermeió'), espígol, lavanda	Flowered aerial part	Anticatarrhal	Lotion Tisane Essence Tincture Syrup	External Internal External External Internal	1 4 2 5 1

				Poultice	External	2
Lavandula stoechas L. (Lamiaceae) (BCN 27278)	Timó	Flowered aerial part	Anticatarrhal	Tisane	Internal	1
Linum usitatissimum L. subsp. *angustifolium* (Huds.) Thell. (Linaceae) (BCN 24920)	Grana de lli, lli, llinet	Seed	Antipneumonic For sore throat	Poultice	External	2 1
Lippia triphylla (L'Hér.) O. Kuntze (Verbenaceae) (BCN 24921)	Marialluïsa	Leaf	Anticatarrhal	Tisane	Internal	1
Lithospermum officinale L. (Boraginaceae) (BCN 24922)	Mill del sol	Aerial part (with fruits)	Anticatarrhal	Tisane	Internal	1
Malva sylvestris L. (Malvaceae) (BCN 24924)	Malva	Flower	Anticatarrhal Decongestive Antitussive	Tisane	Internal	3 1 1
Medicago sativa L. subsp. *sativa* (Fabaceae) (BCN 24927)	Userda	Aerial part	For sore throat	Poultice	External	1
Mentha pulegium L. (Lamiaceae) (BCN 29895)	Poniol	Aerial part	Anticatarrhal	Tisane	Internal	1
Meum athamanticum Jacq. subsp. *athamanticum* (Apiaceae) (BCN 24933)	Herba del meu, meu	Root	Anticatarrhal	Tisane	Internal	10
Nicotiana tabacum L. (Solanaceae) (BCN	Tabac	Leaf	Antipneumonic Antiasthmatic	Poultice Cigarette	External Internal	1 1

27239)						
Olea europaea L. var. *europaea* (Oleaceae) (BCN 24937)	Olivera, oli (product)	Fruit	Against angina	Massage	External	3
Origanum majorana L. (Lamiaceae) (BCN 24938)	Marduix	Leaf	Antipneumonic	Poultice	External	1
Origanum vulgare L. (Lamiaceae) (BCN 24939)	Orenga	Flower	Anticatarrhal Pulmonary decongestive For sore throat	Tisane	Internal	2 1 1
Papaver rhoeas L.(Papaveraceae) (BCN 24940)	Gallarets, rosella, rosella de camp	No data Flower	For sore throat	Tisane Poultice	Internal External	1 2
Papaver somniferum L. (Papaveraceae) (BCN 24941)	Cascall	Fruit and seed	Against breathlessness	Aerosol	Internal	1
Pinus sp. (Pinaceae) (BCN 27259)	Aiguarràs (product)	Excipient	Anticatarrhal	Tincture	External	1
Pinus halepensis Mill. (Pinaceae) (BCN 29826)	Pi bord	Cone	Anticatarrhal Pectoral	Syrup	Internal	1 1
Pinus mugo Turra subsp. *uncinata* (Mill. ex Mirb.) Domin (Pinaceae) (BCN 24947)	Caps de pi, flor de pi, pi, pi negre, reïna (product)	Tender buds Whole plant Cone	Antibronchitic Expectorant Anticatarrhal Antiasthmatic Against tuberculosis Anticatarrhal Antitussive	Tisane Syrup Tisane Without pharmaceutical form Tisane Syrup	Internal	1 1 10 1 1 1 2 3

			Antiasthmatic	Tisane		1
			Expectorant	Tisane		1
			Antiasthmatic	Syrup		1
			Anticatarrhal			1
			For sore throat			1
		Resin	For sore throat	Direct		1
Pinus sylvestris L. (Pinaceae) (BCN 27259)	Pi, pi rajolet, pi roig	Tender buds	Anticatarrhal	Tisane	Internal	7
				Tincture	External	1
			Expectorant	Tisane	Internal	1
			Antibronchitic			1
			Antiasthmatic			1
		Tender cone	Anticatarrhal	Syrup	Internal	5
			Antiasthmatic			1
			Decongestive			1
			Antitussive			1
			Antibronchitic			1
Piper nigrum L. (Piperaceae) (BCN 38292)	Pebre negre	Fruit	Anticatarrhal	Poultice	External	1
			Expectorant			1
Plantago lanceolata L. (Plantaginaceae) (BCN 24949)	Plantatge, plantatge estret, plantatge llarg	Leaf	Anticatarrhal	Tisane	Internal	1
			Antibronchitic			1
			Pulmonary decongestive			1
			Against angina	Gargle	External	1
			For sore throat	Tisane	Internal	4
Plantago major L. (Plantaginaceae) (BCN 24950)	Plantatge, plantatge ample, plantatge rodó	Leaf	Anticatarrhal	Tisane	Internal	1
			Antibronchitic			1
			Bronchopulmonary decongestive			1
			For sore throat	Tisane		2

				Gargle	External	1
Polygala calcarea F.W.Schultz (Polygalaceae) (BCN 24951)	Herba blava	Flowered aerial part	Anticatarrhal	Tisane	Internal	1
Primula veris L. (Primulaceae) (BCN 27280)	Flor de cucut	Flower	Anticatarrhal	Tisane	Internal	1
Pulmonaria longifolia (Bast.) Boreau (Boraginaceae) (BCN 24959)	Fulles de la Mare de Déu, pulmonària	Leaf	Antibronchitic Antipneumonic For lung spots	Tisane	Internal	1 1 1
Punica granatum L. (Punicaceae) (BCN 24960)	Malgrana	Bark Fruit pericarp Fruit	Against angina For sore throat For sore throat For aphony For sore throat	Tisane Direct	Internal	1 1 3 1 1
Pyrus malus L. subsp. *malus* (Rosaceae) (BCN 24961)	Poma, poma borda	Fruit	Anticatarrhal	Syrup	Internal	1
Pyrus malus L. subsp. *mitis* (Wallr.) O.Bolòs et Vigo (Rosaceae) (BCN 24962)	Pomer, pomera	Fruit	Anticatarrhal Antitussive	Without pharmaceutical form Tisane Syrup	Internal	1 1 1
Ramonda myconi (L.) Reichenb. (Gesneriaceae) (BCN 24965)	Orella d'ós	Leaf	Anticatarrhal Expectorant Antitussive	Tisane	Internal	18 1 5
Ranunculus parnassifolius L. (Ranunculaceae) (BCN 24967)	Herba del malgrà	Whole plant	Anticatarrhal	Tisane	Internal	1

Robinia pseudoacacia L. (Fabaceae) (BCN 31298)	Escàcia	Bark	Antitussive	Tisane	Internal	1
Rosa tomentosa Sm. (Rosaceae) (BCN 24973)	Cireres de pastor, escanyaguilles, grataculs, roser, roser bord, roser de bosc, roses bordes	Fruit Flower	Against flu Anticatarrhal Against angina For sore throat For sore throat For sore throat	Tisane Direct Syrup Tisane	Internal	1 2 2 10 2 1 1
Rosmarinus officinalis L. (Lamiaceae) (BCN 24974)	Romaní	Flowered aerial part Tender buds	Anticatarrhal Pectoral Antibronchitic Anticatarrhal Against breathlessness	Tisane Tincture Aerosol Syrup Tisane Tisane Aerosol Poultice Aerosol	Internal External Internal External Internal	7 5 2 1 1 1 1 1 1
Rubus ulmifolius Schott (Rosaceae) (BCN 24978)	Romeguera, móra (fruit)	Tender buds	Against angina For sore throat	Gargle Gargle Tisane	External Internal	1 1 3
Ruta chalepensis L. (Rutaceae) (BCN 24980)	Ruda	Aerial part	Antiasthmatic For sore throat	Cigarette Poultice	Internal External	1 1
Sambucus nigra L. (Caprifoliaceae) (BCN 24984)	Sabuc, flor de sabuc	Flower	Anticatarrhal Antitussive Antibronchitic Against flu	Essence Tisane Smoke Tisane Syrup Smoke	Internal External	7 12 4 14 1 1

		Fruit	Antitussive Antipneumonic Antipleuritic Expectorant For aphony Antibronchitic Anticatarrhal Antitussive Against flu Pectoral For sore throat Expectorant	Tisane Essence Tisane Smoke Tisane Syrup Tisane Syrup Syrup Smoke	Internal	3 1 1 1 1 1 1 3 2 2 1 1 1 1
Santolina chamaecyparissus L. (Asteraceae) (BCN 24986)	Camamilla, camamilla de botó, camamilla del botó groc, camamilla de l'hort	Inflorescence	For sore throat	Aerosol	Internal	1
Satureja calamintha (L.) Scheele subsp. *ascendens* (Jord.) Briq. (Lamiaceae) (BCN 24989)	Poniol	Flowered aerial part	Anticatarrhal Against flu	Tisane	Internal	2 1
Scabiosa columbaria L. (Dipsacaceae) (BCN 24993)	Escabiosa, escapiosa, herba d'escapiosa	Flowered aerial part	Against flu	Tisane	Internal	1
Scirpus holoschoenus L. (Cyperaceae) (BCN 29789)	Joncs de ribera	Root	Antitussive	Tisane	Internal	1
Secale cereale M.Bieb.	Segle, pa morè	Seed	Antipneumonic	Poultice	External	1

(Poaceae) (BCN 27243)	(product)					
Senecio leucophyllus L. (Asteraceae) (BCN 24998)	Herba blanca	Flowered aerial part	Anticatarrhal	Tisane	Internal	7
Sisymbrium officinale L. (Brassicaceae) (BCN 25002)	Herba del constipat, herba dels cantaires	Flowered aerial part	Anticatarrhal Antitussive For sore throat For vocal cords	Tisane Tisane (massage) Tisane	Internal External Internal	2 1 1 1 1
Solanum tuberosum L. (Solanaceae) (BCN 25006)	Patata	Tuber	Anticatarrhal	Poultice	External	1
Taxus baccata L. (Taxaceae) (BCN 25017)	Teix	Bark	Anticatarrhal	Tisane	Internal	1
Teucrium chamaedrys L. (Lamiaceae) (BCN 29806)	Timons	Flowered aerial part	Anticatarrhal	Aerosol	Internal	1
Thymus serpyllum L. subsp. *camaedrys* (Fries) Celak. (Lamiaceae) (BCN 25019)	Farigoleta, farigoleta de muntanya, serpó	Flowered aerial part	Antitussive Expectorant	Essence	Internal	1
Thymus serpyllum L. subsp. *nervosus* (Gay ex Willk.) Nyman. (Lamiaceae) (BCN 25020)	Farigola de pastor, farigolet, farigoleta, farigoleta de muntanya, xerpoll	Flowered aerial part	Antiasthmatic Anticatarrhal	Tisane Tisane	Internal	1 2
Thymus vulgaris L. (Lamiaceae) (BCN 25023)	Farigola	Flowered aerial part	Anticatarrhal	Tisane Tincture Aerosol Syrup	Internal External Internal	4 1 1 1

			For sore throat	Aerosol	Internal	1
Tilia platyphyllos Scop. (Tiliaceae) (BCN 25024)	Tell (often pronounced 'tei'), til·la, flor de tell (pronounced 'tei')	Inflorescence with bract	Anticatarrhal Against flu	Tisane Tisane	Internal	47 1
Trifolium alpinum L. (Fabaceae) (BCN 25025)	Regalèssia, regalíssia	Root Whole plant	Anticatarrhal Anticatarrhal	Tisane Tisane	Internal Internal	4 2
Triticum aestivum L. (Poaceae) (BCN 27284)	Blat, pa (product)	Seed	Antipneumonic	Poultice	External	1
Tussilago farfara L. (Asteraceae) (BCN 25028)	Fulles de vellut, pota de cavall	Inflorescence Leaf	Antitussive Anticatarrhal Expectorant	Tisane	Internal	1 1 1
Urtica dioica L. (Urticaceae) (BCN 25030)	Ortiga	Root Aerial part	Against flu (preventive) Antitussive (for children) Against whooping cough Against flu (preventive)	Tisane Tisane	Internal	1 1 1 1
Urtica urens L. (Urticaceae) (BCN 25031)	Ortrigons	Aerial part	For sore throat	Tisane	Internal	1
Valeriana officinalis L. (Valerianaceae) (BCN 25033)	Valedriana	Root	Anticatarrhal	Tisane	Internal	1
Verbascum pulverulentum Vill. (Scrophulariaceae) (BCN 25025)	Cua de guilla, flor de torpa, torpa	Flower	Anticatarrhal Antiasthmatic	Tisane Poultice Tisane	Internal External Internal	3 1 1
Verbena officinalis L. (Verbenaceae) (BCN	Berbena	Flowered aerial part	Antipneumonic Antipleuritic	Poultice	External	2 1

25036)						
Veronica officinalis L (Scrophulariaceae) (BCN 25037)	Herba de Santa Caterina	Flowered aerial part	Expectorant	Tisane	Internal	1
Vinca major L. (Apocynaceae) (BCN 25039)	Blincaperblinca	No data	For sore throat	Tisane	Internal	1
Viola alba Besser (Violaceae) (BCN 27286)	Viola	No data	For sore throat	Tisane	Internal	1
Viola cf. *sylvestris* Lam. (Violaceae) (BCN 27791)	Viola	No data	For sore throat	Tisane	Internal	1
Viscum album L. (Santalaceae) (BCN 25042)	Esquercit, escarsí, escarsit	Whole plant Buds Leaf	Anticatarrhal Anticatarrhal Anticatarrhal	Tisane	Internal	3 1 1
Vitis vinifera L. (Vitaceae) (BCN 25043)	Raïmera Aiguardent, esperit de vi, vi, vinagre, brandi, vi camforat (products)	Fruit	Anticatarrhal Antitussive Against angina For sore throat	Without pharmaceutical form Liniment Tisane Poultice Without pharmaceutical form Poultice	Internal External Internal External External	1 1 1 1 1 1 4
Zea mays L. (Poaceae) (BCN 25034)	Cabells de blat de moro	Styles and stigmas	Anticatarrhal	Tisane	Internal	1

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Table 2
Animal and mineral products used for medicinal purposes for respiratory diseases in the studied area.

Scientific name	Catalan name	Used part or product	Use	Application way	Number of reports
Apis mellifera L.	Abella, mel (product)	Honey	Antidiphteric	Poultice	1
Bos taurus L.	Llet, vaca	Milk Whole animal	Antibronchitic Anticatarrhal Against tuberculosis	Syrup Direct	1 1 1
Canis lupus familiaris L.	Gos	Excrement	Antipneumonic Antidiphteric For sore throat	Poultice Direct	1 1 1
Columba livia Gmelin	Colom	Excrement	Antipneumonic	Poultice	1
Gadus morhua L.	Bacallà, oli de fetge de bacallà (product)	Liver oil	Antitussive	Syrup	1
Gallus gallus domesticus L.	Gallina	Excrement	Antipneumonic	Poultice	1
Helix aspersa Müller	Cargol	Whole animal	Antitussive	Syrup	1
Timon lepidus Daudin	Lluert	Whole animal	Antipneumonic	Ointment	2
Meles meles L.	Teixó	Fat	Antipneumonic	Massage	1
Oryctolagus cuniculus L.	Conill	Skin	Antipneumonic	Direct	2
Ovis aries L.	Xai	Skin	Antipneumonic	Direct	1
Rhinechis scalaris Schinz	Serp blanca	Whole animal	Anticatarrhal	Tisane	2
Sciurus vulgaris L.	Esquirol	Whole animal	Against whooping cough	Tisane	1
Sus scrofa domestica L.	Porc. Greix, greix de la mocada,	Fat	Antibronchitic Anticatarrhal Expectorant	Massage Poultice	1 2 1

	sagí dolç, sagí ranci, sagí vell (products)		Antipneumonic For sore throat		2 1
Petroleum (oil)	Petroli		Antipneumonic For sore throat Against angina	Poultice	3 1 1
Clay	Argila, terra argila (pronounced terra gila)		Antipneumonic	Poultice	2
Emetic tartar	Tàrtar	Antimonium and potassium tartrate	Against flu	Tisane	1
Effervescent magnesia	Magnèsia efervescent	Mixture of magnesium carbonate, sodium bicarbonate and tartaric or citric acid	Against whooping cough	Tisane	1